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APPLICATION FOR UNITED STATES LETTERS PATENT

A PRINTING UNIT CYLINDER FOR A ROTARY PRINTING MACHINE

Inventors:
Klaus T. REICHEL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a printing-unit cylinder for a rotary printing machine. More particularly, the present invention relates to a transfer cylinder, a plate cylinder or a back pressure cylinder. The present invention further relates to a barrel, a body and an entire printing unit cylinder for effectively dissipating undesired heat during the printing process.

2. Description of the Related Art

When using a transfer cylinder in a rotary printing machine, flexure work in the rubber blanket during rolling contact with a plate cylinder and a back-pressure cylinder produces dissipation energy and results in undesirable heating of the rubber blanket. EP 0 697 284.A1 suggests a solution to the problem by providing internal cooling. However, this internal cooling system is complex and can cause problems in both producing the system and in operating it.

DE 196 19 655 A1 suggests an improvement in heat transfer between the rubber blanket and the transfer cylinder bearing the blanket. It is proposed that the rubber blanket contain a heat-dissipating inlay or underlay designed to dissipate the heat radially to the transfer cylinder. However, in this system localized differences in heating of the blanket still occur. These local temperature differences can be caused by the subject or as a result of the blanket having variations in compressibility. These variations may be caused by a lack of a

homogenous blanket material. As a result, the differences in heating over the blanket are transmitted to the transfer cylinder which then has variations in temperature. Non-uniform heating of the transfer cylinder can in turn lead to deformation such as curvature of its longitudinal axis with resultant disruption of ink transfer. This impairs the printing quality.

Non-uniform heating as discussed may also occur on other printing-unit cylinders, for example plate cylinders. The same cylinder deformations and impairment to the printing quality can occur in this instance as well.

SUMMARY OF THE INVENTION

The object of the invention is to provide a printing-work cylinder which addresses the problems of the prior art.

A further object of the present invention is to provide a printing-work cylinder that is subject only to low deformation even under operating conditions which increase the temperature of the printing unit.

Briefly stated, the present invention is a printing unit cylinder for a rotary printing machine including a cylinder made of a metallic material having a linear coefficient of expansion of about $\alpha < 5 \times 10^{-6} K^{-1}$ in a temperature range of from about 20° to about 60°.

According to an embodiment, a printing unit cylinder is made of a metallic material having a linear coefficient of expansion of about $\alpha < 1.5 \times 10^{-6} K^{-1}$ in a temperature range of from about 20° to about 60°.

According to another embodiment of the present invention, a printing unit cylinder is made of an iron alloy having from about 30% to about 40% nickel by weight.

According to another embodiment of the present invention, a printing unit cylinder is made of an iron alloy having about 36% nickel by weight.

A cylinder for a rotary printing unit made according to the present invention will deform only slightly under conditions where regions of the cylinder are heated to a greater extent than other regions on the cylinder. The low coefficient of expansion results in the regions on the cylinder having the greater temperature expanding only slightly more as compared to the regions on the cylinder having a lower temperature. As a result, the minor

deformation of the cylinder has little to no influence on ink transfer and thus causes little to no impairment of the printing quality. As a result of this low bending of the transfer cylinder, during operation of the printing unit, the pressure on the rubber blanket increases only to an insignificant degree with the associated introduction of heat. As a result, deformation or bending of printing unit cylinders does not escalate.

Other objects and features of the present invention will become apparent from the following detailed description considered in conjunction with the accompanying drawings. It is to be understood, however, that the drawings are designed solely for purposes of illustration and not as a definition of the limits of the invention, for which reference should be made to the appended claims. It should be further noted that the drawings are merely intended to conceptually illustrate the structures and procedures described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

In the associated drawings, in schematic form:

Fig. 1 shows a printing unit cylinder, which consists completely of a metallic material with a low coefficient of expansion; and

Fig. 2 shows a printing unit cylinder whose body consists of a metallic material with a low coefficient of expansion.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

Fig. 1 shows a printing unit cylinder 1, made completely of a metallic material with a linear coefficient of expansion of $\alpha < 5 \times 10^{-6} K^{-1}$ in a temperature range of from about 20° to about 60°. An embodiment of the present invention is a printing-unit cylinder 1 made from an iron alloy having 36% nickel by weight. The iron/nickel alloy proposed is described in "Nickel und Nickellegierungen" [Nickel and Nickel Alloys] by K.E. Volk, Springer-verlab Berlin, Heidelberg, New York, 1970, pages 27 to 39. Iron having this proportion of nickel has an average coefficient of expansion in the temperature range of from 0°C to 100°C of about $\alpha < 5 \times 10^{-6} K^{-1}$. This is approximately 10 to 20 times less than the conventional steel used for production of the cylinder. The proportion of nickel can lie in the range of between 30% and 40% by weight, while retaining an acceptable but higher coefficient of expansion. For adequate dimensional stability of the printing unit cylinder 1, the linear coefficient of expansion should lie below $5 \times 10^{-6} K^{-1}$.

Fig. 2 shows a printing unit cylinder 1.1 in which only the barrel 2 of the body of the cylinder is made from an iron/nickel alloy having a linear coefficient of expansion $\alpha < 5 \times 10^{-6} K^{-1}$ in a temperature range of from about 20° to about 60°. The two journals 3, 4 are made from a less expensive steel and are screwed onto the body 2 of the cylinder at the ends. In this design as well, the printing unit cylinder 1.1 possesses good dimensional stability when non-uniform heating occurs during use.

The printing unit cylinders 1 and 1.1 described can be, for example, plate cylinders, transfer cylinders or back-pressure cylinders.

Thus, while there has been shown and described and pointed out fundamental novel features of the invention as applied to a preferred embodiment thereof, it will be understood that various omissions and substitutions and changes in the form and details of the devices illustrated, and in their operation, may be made by those skilled in the art without departing from the spirit of the invention. For example, it is expressly intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Moreover, it should be recognized that structures and/or elements and/or method steps shown and/or described in connection with any disclosed form or embodiment of the invention may be incorporated in any other disclosed or described or suggested form or embodiment as a general matter of design choice. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.